

If used in its entirety, Kids' Quest "Investigators on the Job" will help students develop an understanding of science in accordance to the following South Dakota Science Standards.

## **Science Standards**

**K-12**

### **Goals and Indicators**

#### **NATURE OF SCIENCE STANDARDS**

**Goal 1: Students will explore, evaluate, and communicate personal and scientific investigations to understand the nature of science.**

**RATIONALE:**

The nature of science goal emphasizes those "processes of science" that should integrate with scientific knowledge to develop an understanding of how science works. Science involves a systematic approach to information gathering and problem solving through processes such as inquiry, observation, data analysis, experimentation, communication, and collaboration. Students use scientific inquiry to ask questions, plan and conduct investigations, use appropriate tools and techniques to gather data, think critically and logically about relationships between evidence and explanations, construct and analyze alternative explanations, and communicate scientific arguments. Through these processes, scientific knowledge is studied, tested, and increased over time.

***Indicator 2: Apply the skills necessary to conduct scientific investigations.***

#### **PHYSICAL SCIENCE STANDARDS**

**Goal 2: Students will use appropriate scientific models to describe and quantify the nature and interactions of matter and energy.**

**RATIONALE:**

Physical science is concerned with matter and energy, and the interactions between the two. Students begin the study of the physical world by learning about the properties of objects and materials, the position and motion of objects, light, heat, electricity, and magnetism. Understanding changes of properties in matter, motions, forces, and transfer of energy provide a basis for learning about the structure of atoms, structure of matter, chemical reactions, conservation of energy, and the interactions of energy and matter. The science facts, concepts, principles, theories, and models related to physical science that are important for all students to know, understand, and use are the focus of the standards for this goal.

***Indicator 1: Describe structures and properties of, and changes in, matter.***

***Indicator 3: Analyze interactions of energy and matter.***

**Individual South Dakota Standards are included for grades 6-9.**

#### **SOUTH DAKOTA SCIENCE STANDARDS**

**6-8**

---

## Sixth Grade Nature of Science Grade Standards, Supporting Skills, and Examples

### Indicator 1: Understand the nature and origin of scientific knowledge.

*Note: These skills should be taught and practiced in grade-level study of Physical, Life, and Earth/Space Science although mastery is not expected at these grade levels.*

Bloom's Taxonomy Level	Standard, Supporting Skills, and Examples
	<ul style="list-style-type: none"> <li>✓ Recognize scientific knowledge as not merely a set of static facts, but is dynamic and affords the best current explanations. Examples: flat Earth, spontaneous generation</li> <li>✓ Identify important contributions to the advancement of science from people of differing cultures, genders, and ethnicity. Examples: George W. Carver-peanuts, Gregor Mendel-genetics, Sylvia Earle-oceanography, Darwin-evolution</li> </ul>

### Indicator 2: Apply the skills necessary to conduct scientific investigations.

Bloom's Taxonomy Level	Standard, Supporting Skills, and Examples
(Application)	<p><b>6.N.2.1. Students are able to pose questions that can be explored through scientific investigations.</b></p> <p><b>Example:</b> How does light affect plant growth?</p> <ul style="list-style-type: none"> <li>✓ Conduct systematic scientific investigations. <ul style="list-style-type: none"> <li>• Use appropriate supportive technologies.</li> <li>• Describe the limits of accuracy inherent in a particular measuring device or measurement procedure.</li> <li>• Manipulate one variable over time with many repeated trials to test a hypothesis.</li> <li>• Construct and interpret graphs from data to make predictions.</li> <li>• Use research methods to investigate practical and/or personal scientific problems and questions.</li> </ul> </li> <li>✓ Describe and demonstrate various safety factors associated with different types of scientific activity. <ul style="list-style-type: none"> <li>• Use appropriate scientific equipment safely in all investigations.</li> <li>• Wear appropriate attire.</li> </ul> </li> </ul>

## Sixth Grade Physical Science Grade Standards, Supporting Skills, and Examples

**Indicator 3: Analyze interactions of energy and matter.**

<b>Bloom's Taxonomy Level</b>	<b>Standard, Supporting Skills, and Examples</b>
(Comprehension)	<p><b>6.P.3.1. Students are able to identify types of energy transformations.</b></p> <p><b>Examples:</b> mechanical to electrical, chemical to light, kinetic to potential (and vice versa)</p> <ul style="list-style-type: none"><li>✓ Explain basic principles of electricity and magnetism including static, current, circuits, and magnetic fields.</li><li>✓ Investigate the properties of light (electromagnetic spectrum).</li><li>✓ Illustrate sunlight to chemical (photosynthesis).</li></ul>

**Seventh Grade Nature of Science  
Grade Standards, Supporting Skills, and Examples**

*Note: These skills should be taught and practiced in grade-level study of Physical, Life, and Earth/Space Science although mastery is not expected at these grade levels.*

**Indicator 2: Apply the skills necessary to conduct scientific investigations.**

<b>Bloom's Taxonomy Level</b>	<b>Standard, Supporting Skills, and Examples</b>
(Application)	<p><b>7.N.2.1. Students are able to conduct scientific investigations using given procedures.</b></p> <ul style="list-style-type: none"><li>• Use appropriate supportive technologies.</li><li>• Determine the limits of accuracy inherent in a particular measuring device or procedure.</li><li>• Control variables to test hypotheses by repeated trials.</li><li>• Identify sources of experimental error.</li><li>• Interpret to make predictions and/or justify conclusions.</li><li>• Use research methods to investigate practical and/or personal scientific problems and questions.</li></ul> <p>✓ Describe and demonstrate various safety factors associated with different types of scientific activity.</p> <ul style="list-style-type: none"><li>• Demonstrate appropriate use of apparatus and technologies for investigations.</li><li>• Use proper safety procedures in all investigations.</li><li>• Wear appropriate attire.</li></ul> <p>✓ Analyze the benefits and potential of scientific investigations.</p>

**Eighth Grade Nature of Science  
Grade Standards, Supporting Skills, and Examples**

**Indicator 2: Apply the skills necessary to conduct scientific investigations.**

<b>Bloom's Taxonomy Level</b>	<b>Standard, Supporting Skills, and Examples</b>
(Synthesis)	<p><b>8.N.2.1. Students are able to design a replicable scientific investigation.</b></p> <ul style="list-style-type: none"><li>• Use appropriate supportive technologies.</li><li>• Assess the limits of accuracy inherent in a particular measuring device or procedure.</li><li>• Control variables to test hypotheses by repeated trials and by identifying sources of experimental error.</li><li>• Interpret data to justify predictions or conclusions.</li><li>• Use research methods to investigate practical and/or personal scientific problems and questions.</li><li>• Select appropriate scientific equipment and technologies for investigations and experiments.</li><li>• Use proper safety procedures in all investigations.</li><li>• Wear appropriate attire.</li></ul> <p>✓ Evaluate the benefits and potential of scientific investigations.</p>

**Eighth Grade Physical Science  
Grade Standards, Supporting Skills, and Examples**

After careful consideration of current research and input from educators throughout the state, the Committee revised former standards to facilitate effective instruction and student mastery. Grade eight standards emphasize Earth/Space Science.

**Indicator 3: Analyze interactions of energy and matter.**

*See note above.*

**SOUTH DAKOTA SCIENCE STANDARDS  
9-12**

---

**Core High School Nature of Science  
Standards, Supporting Skills, and Examples**

**Indicator 2: Apply the skills necessary to conduct scientific investigations.**

<b>Bloom's Taxonomy Level</b>	<b>Standard, Supporting Skills, and Examples</b>
-------------------------------	--

(Synthesis)	<p><b>9-12.N.2.1. Students are able to apply science process skills to design and conduct student investigations.</b></p> <ul style="list-style-type: none"> <li>• Identify the questions and concepts to guide the development of hypotheses.</li> <li>• Analyze primary sources of information to guide the development of the procedure.</li> <li>• Select and use appropriate instruments to extend observations and measurements.</li> <li>• Revise explanations and models based on evidence and logic.</li> <li>• Use technology and mathematic skills to enhance investigations, communicate results, and defend conclusions.</li> </ul> <p>Examples:</p> <p>Computer-based data collection</p> <p>Graphical analysis and representation</p> <p>Use appropriate technology to display data (i.e. spreadsheets, PowerPoint, web).</p>
(Application)	<p><b>9-12.N.2.2. Students are able to practice safe and effective laboratory techniques.</b></p> <ul style="list-style-type: none"> <li>• Handle hazardous materials properly.</li> <li>• Use safety equipment correctly.</li> <li>• Practice emergency procedure.</li> <li>• Wear appropriate attire.</li> <li>• Practice safe behaviors.</li> </ul>

### Core High School Physical Science Standards, Supporting Skills, and Examples

#### Indicator 3: Analyze interactions of energy and matter.

Bloom's Taxonomy Level	Standard, Supporting Skills, and Examples
(Application)	<p><b>9-12.P.3.1. Students are able to describe the relationships among potential energy, kinetic energy, and work as applied to the Law of Conservation of Energy.</b></p> <ul style="list-style-type: none"> <li>• Describe how energy can be transferred and transformed to produce useful work.</li> </ul> <p>Examples:</p> <p>Diagram simple energy transfers, describing the objects and the forms of energy gained and lost.</p> <p>Use simple machines as an example of the transmission of energy.</p>

	<ul style="list-style-type: none"> <li>Given the formulas, calculate the mechanical advantage and efficiency of selected systems.</li> <li>Explain methods of heat transfer.</li> </ul> <p>Examples: conduction, radiation, and convection</p>
(Comprehension)	<p><b>9-12.P.3.2. Students are able to describe how characteristics of waves are related to one another.</b></p> <ul style="list-style-type: none"> <li>Relate wavelength, speed, and frequency (<math>v = \lambda f</math>).</li> <li>Distinguish between transverse and longitudinal waves.</li> </ul> <p>Examples:</p> <p>Discuss changes in frequency of waves using the Doppler Effect.</p> <p>Compare the energy of different frequency ranges of waves with in the electromagnetic spectrum.</p> <p>Describe how different colors of light waves have different amounts of energy.</p>

**Core High School Science, Technology, Environment, and Society  
Standards, Supporting Skills, and Examples**

**Indicator 2: Analyze the relationships/interactions among science, technology, environment, and society.**

<b>Bloom's Taxonomy Level</b>	<b>Standard, Supporting Skills, and Examples</b>
(Evaluation)	<p><b>9-12.S.2.1. Students are able to describe immediate and long-term consequences of potential solutions for technological issues.</b></p> <p><b>Examples:</b> environmental, communication, internet, entertainment, construction, manufacturing, power and transportation, energy sources, health technology, and biotechnology issues</p> <ul style="list-style-type: none"> <li>Describe how the pertinent technological system operates.</li> </ul> <p>Example: waste management facility</p>
(Synthesis)	<p><b>9-12.S.2.3. Students are able to analyze and describe the benefits, limitations, cost, and consequences involved in using, conserving, or recycling resources.</b></p> <p><b>Examples:</b> mining, agriculture, medicine, school science labs, forestry, energy, disposable diapers, computers, tires</p>

**Advanced High School Nature of Science  
Standards, Supporting Skills, and Examples**

**Indicator 2: Apply the skills necessary to conduct scientific investigations.**

<b>Bloom's Taxonomy Level</b>	<b>Standard, Supporting Skills, and Examples</b>
(Synthesis)	<b>9-12.N.2.1A. Students are able to manipulate multiple variables with repeated trials.</b> <ul style="list-style-type: none"> <li>• Use a control and change one variable at a time.</li> </ul> <p>Examples: gas laws, seed germination and plant growth, Newton's Second Law</p>
(Evaluation)	<b>9-12.N.2.2A. Students are able to use statistical analysis of data to evaluate the validity of results.</b> <ul style="list-style-type: none"> <li>• Use correlation coefficient with graphs.</li> </ul> <p>Examples: chi-squared value in genetics, determination of absolute zero, verify concentration of an unknown solution</p>
(Analysis)	<b>9-12.N.2.3A. Students are able to demonstrate correct precision in measurements and calculations.</b> <ul style="list-style-type: none"> <li>• Use significant digits to illustrate precision in measurement.</li> <li>• Factor label conversion, scientific notation.</li> </ul>

**Advanced High School Physical Science  
Standards, Supporting Skills, and Examples**

**Indicator 1: Describe structures and properties of, and changes in, matter.**

<b>Bloom's Taxonomy Level</b>	<b>Standard, Supporting Skills, and Examples</b>
-------------------------------	--

(Application)	<p><b>9-12.P.1.5A. Students are able to examine energy transfer as matter changes.</b></p> <p><b>Examples:</b></p> <p>Determine <math>\Delta H</math>, <math>\Delta G</math>, <math>\Delta S</math> for thermo-chemical equations.</p> <p>Calculate energy involved in phase changes.</p> <p>Compare the specific heats of various substances.</p> <ul style="list-style-type: none"> <li>Describe physical and chemical processes that result in endothermic and exothermic changes.</li> <li>Describe energy transfer as matter changes from one phase to another.</li> </ul>
---------------	---

## NATURE OF SCIENCE STANDARDS 9-12

### Indicator 1: Understand the nature and origin of scientific knowledge.

Core HS Standards
9-12.N.1.2. (Synthesis) Describe the role of observation and evidence in the development and modification of hypotheses, theories, and laws.

### Indicator 2: Apply the skills necessary to conduct scientific investigations.

*Note: These skills should be taught and practiced in grade-level study of Physical, Life, and Earth/Space Science although mastery is not expected at these grade levels.*

Core HS Standards
9-12.N.2.1. (Synthesis) Apply science process skills to design and conduct student investigations.
9-12.N.2.2. (Application) Practice safe and effective laboratory techniques.
Advanced HS Standards
9-12.N.2.1A. (Synthesis) Manipulate multiple variables with repeated trials.
9-12.N.2.2A. (Evaluation) Use statistical analysis of data to evaluate the validity of results.



9-12.N.2.3A. (Analysis) Demonstrate correct precision in measurements and calculations.